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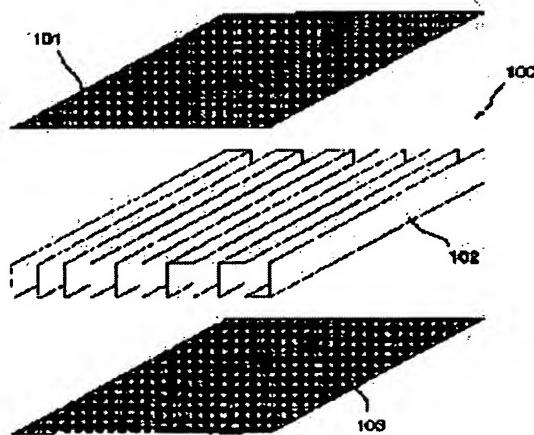
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(54) NOISE ABSORPTION EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a noise absorption equipment which is used when noise is absorbed by using a rear air layer and absorbs noise of high to low tone regions from both sides regardless of limited thickness by making good use of the fluctuating property of a sound wave.

SOLUTION: Such an acoustic material is used in this noise absorption equipment, as is obtained by interposing an aluminum plate 102 between a pair of acoustic plates 101, 103 obtained by subjecting a metallic fiber material to compression molding.



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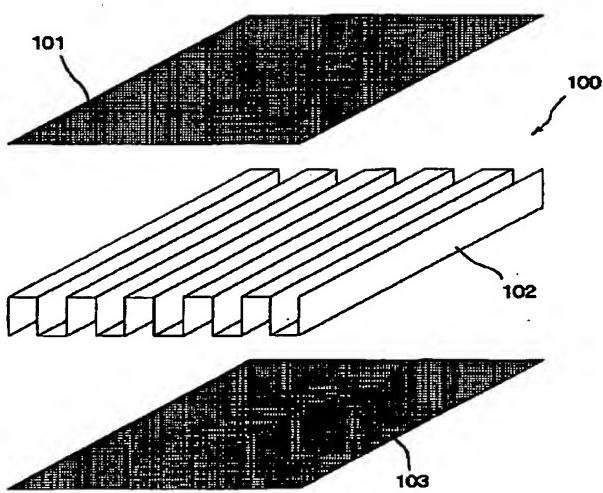
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(54)【発明の名称】 吸音装置

(57)【要約】

【課題】 背後空気層による吸音を行う吸音装置において、音波の流動的な性質を利用することで、限られた厚さでありながら、両面からの吸音を低音域まで行うことができる吸音装置にある。

【解決課題】 この吸音装置は、金属繊維材料を圧縮成形した一対の板状吸音材101、103でもって、アルミニウム板102が挟まれている。



【特許請求の範囲】

【請求項1】 金属繊維材料を圧縮成形することで得た一対の板状吸音材でもって、波型形状板が挟まれていることを特徴とする吸音装置。

【請求項2】 波型形状板のピッチまたはその平均値が500mm以下であることを特徴とする請求項1記載の吸音装置。

【請求項3】 波型形状板のピッチまたはその平均値が300mm以下であることを特徴とする請求項1記載の吸音装置。

【請求項4】 金属繊維材料及び波型形状板がアルミニウム繊維やステンレス繊維などの金属繊維で構成されていることを特徴とする請求項1乃至3記載の吸音装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、吸音装置に係り、詳しくは、背後空気層の作用による吸音を行う吸音装置において、音波の波動的な性質を利用することで、限られた厚さでありながら、両面からの吸音を低音域まで行うことができる吸音装置に関するものである。

【0002】

【従来の技術】吸音装置としては、ガラスウールやロックウールなど無機質繊維の背後に背後空気層を設けたものが広く知られている。

【0003】吸音装置として問題となるのは、500Hz以下というような低音域での吸音性能である。低音域での吸音性能を高めるには、ガラスウールやロックウールなど無機質繊維として密度の高いものを用い、またその厚さを厚くし、さらに背後空気層を厚くすればよい。しかし、この構造には、以下のような課題がある。

【0004】① ガラスウールなどの占める重量が大きく、全体として重量が重くなる。

② 健康への悪影響が懸念されるガラスウールなどを大量に用いることは好ましくない。

③ 長期の使用において、ガラスウールなどの吸湿や劣化による吸音性能の低下が課題となる。

④ ガラスウールなどは、産業廃棄物として処理しなくてはならず、リサイクル性に課題がある。

【0005】このような課題を解決する技術として、アルミニウム繊維などの金属繊維を用いた吸音材料が知られている（例えば、実公平5-2646号公報参照）。

【0006】特に、アルミニウム繊維を用いた場合には、軽量で、またその厚さが薄くても低音域において高い吸音性能が得られ、上述した課題は、ほぼ解消することができる利点がある。

【0007】

【発明が解決しようとする課題】このような吸音材と、その背後に設けられた背後空気層を備えた吸音装置は、吸音材料を配置した面のみが吸音性能をもつこととなり、背後空気層が設けられた面側の吸音性能は得られな

いことになる。

【0008】ところで、市場には、吸音パネルのような吸音装置において、両面に吸音性能が得られるものが求められている。例えば、音響的な仕切りや両面から入射する騒音の吸音板といった目的に利用されることがある。

【0009】図7(A)に示す吸音装置400は、古典的な吸音材402と背後空気層401からなり、この構造では、403側から入射する音波は吸音するが、404側から入射する音波は吸音しない。即ち、片面から入射する音波しか吸音しない構造である。

【0010】この構造において、両面からの吸音を可能とするには、さらにもう一組の吸音材406及び背後空気層405からなる吸音装置407を用意し、図7(B)に示すように2つの吸音装置400と407を背中合わせに張り合わせた構造の吸音装置408とすればよい。

【0011】しかしながら、これでは全体として吸音装置408の厚さが厚くなり、設置場所などに制限の多い吸音装置としては好ましくない。また、低音域での吸音性能を高くしようとした場合、背後空気層401、405を厚くしなければならないが、その場合、さらに吸音装置408全体の厚さが厚くなってしまう。

【0012】逆に、図7(B)に示すような構造の吸音装置408において、吸音装置全体の厚さを薄くしようとすると、背後空気層401、405の厚さが小さくなり、低音域における所定の吸音効果が得られなくなってしまう。

【0013】本発明は、上記の課題を解決するものであり、特に、両面からの吸音が可能であり、低音域での吸音性能が高いことを主たる目的とする吸音装置を提供することにある。

【0014】

【課題を解決するための手段】本発明に係る吸音装置の第1の発明は、金属繊維材料を圧縮成形した一対の板状吸音材でもって、波型形状板が挟まれていることを特徴とする。

【0015】本発明の第2の発明は、波型形状板のピッチまたはその平均値が500mm以下であることを特徴とし、第3の発明は、波型形状板のピッチまたはその平均値が300mm以下であることを特徴とし、第4の発明は、金属繊維材料及び波型形状板がアルミニウム繊維やステンレス繊維などの金属繊維で構成されていることを特徴とする。

【0016】波型形状板としては、断面が角波形状のもの、角波形状の断面構造において角が丸みを帯びたものの、鋸形状のもの、その他所定の形状が周期的に繰り返される断面構造のものを挙げることができる。

【0017】

【作用】第1の発明を採用することで、簡単で軽量な構

造でありながら、低音域での吸音性能に優れた両面吸音装置が得られる。

【0018】第2の発明を採用することで、より高音域での吸音が可能となる両面吸音装置が得られ、第3の発明を採用することで、さらにより高音域までの吸音が可能となり、第4の発明を採用することで、軽量でリサイクル性に優れた吸音装置が得られる。

【0019】

【発明の実施の形態】以下、本発明の実施形態を図面に基づいて説明する。図1(A)は、本発明に係る吸音装置の基本的な実施形態を示す説明用断面図、図1(B)は、同組み合せた実施形態を示す説明用断面図、図2は、本発明に係る吸音パネルの例を示す分解図、図3は、同説明用断面図、図4は、背後空気層の背後厚さを300mmとし、角波形状板のピッチ幅を変化させた吸音パネルの統計入射吸音率を示すグラフ、図5は、背後空気層の背後厚さを200mmとした同様な吸音パネルの統計入射吸音率を示すグラフ、また、図6は、本発明の実施形態における他の波型形状板の断面構造を示す図である。

【0020】初めに、本発明に係る吸音装置10の基本的な実施形態を図1に基づいて説明する。この吸音装置10は、表面の吸音材11と背後空気層12からなる中空箱形体aと、これと向きを逆にした裏面の吸音材13と背後空気層14からなる中空箱形体bとが互いに吸音材11、13が表面或いは裏面に交互に位置するように組み合わせた構造に特徴があり、左右の側面板15、15と吸音材11、13の表面板16或いは裏面板17は、非通気性の材料である金属材料などで構成されている。

【0021】この構成によれば、背後空気層12、14の厚さを充分な厚さとすることができるので、低音域までの吸音性能を確保することができる。しかし、吸音に寄与する吸音材11、13の面積が片面で半分となるが、図1(B)のように中空箱形体a、b、a、b、…の繰り返しの周期が入射する音波の波長に対して十分に小さければ、音波の波動性により音波は、背後空気層12、14を有する吸音材11、13の領域に回り込み、ある程度吸音されることになる。従って、図1(B)における中空箱形体a、b、a、b、…の繰り返しの周期を細かく小さくすることで、より高音域までの吸音が可能となる。本発明は、上述した基本的な実施形態を基に、より簡単な構造、より軽量、より低コストなものとして得られるものである。

【0022】次に、本発明を実施した一例を図2と図3に示す吸音パネル100について説明する。この吸音パネル100は、アルミニウム繊維を板状に圧縮した吸音材101と103とでもって、角波形状に加工したアルミニウム板102が挟まれて固定された構造となっている。

【0023】アルミニウム繊維としては、直径が50～200μmのアルミニウム繊維を面密度が500～4000g/m²、厚さが1～5mm程度となるように加圧圧縮したものを用いる。また、角波形状のアルミニウム板102としては、厚さ0.5～3mm程度のものを角波形状にプレス加工したものを用いるとよい。なお、吸音材料101、103としては、アルミニウム以外の金属からなる繊維材料、ステンレス繊維などを用いることができる。

【0024】アルミニウム板102におけるピッチ幅dの寸法は、500mm以下、好ましくは300mm以下が良い。その周期性は、ピッチ幅dを一定なものとしたものに限定されずに異なるピッチ幅にするのもよく、また、表面側と裏面側とでピッチ幅dの値を異にするなど任意な事項である。なお、ピッチ幅dの値が均一でない場合、その平均値を500mm以下、好ましくは300mm以下とすることが望ましい。ピッチ幅dの値が500mm以上であると、高音域側の吸音性能が低下し、吸音パネルとしての吸音帯域が狭くなり好ましくない。

【0025】アルミニウム板102の材質は、アルミニウム以外の金属、例えばステンレスなどの金属材料や、金属以外の材料、例えばガラスウールやロックウールなどの無機質繊維であってもよい。しかし、吸音材と角波形状板を全てアルミニウムで構成することは、リサイクル性、耐久性、軽量性といった点で特に好ましい。また、角波形状板が補強材となり、軽量で構造的にも丈夫なものとすることができます。

【0026】角波形状の凹凸の繰り返しは、少なくとも5個以上(5周期以上)、好ましくは10個以上(10周期以上)あることが好ましい。これは、上述するようにアルミニウム板102がある程度の面積を持ったものにしないと所定の吸音効果が得られないからである。

【0027】本発明の実施品は、通常の吸音装置の他に音響的な仕切りや両面から入射する騒音の吸音パネルなどに利用することができる。本発明を採用した場合、低音域での吸音性能に優れた両面からの吸音が可能な吸音パネルを得ることができる。この吸音パネルは、2方向からの音波を吸音する機能があるにもかかわらず、従来品の1方向からの音波の吸音に必要とされる厚さで事足りるという優位性がある。また、波型形状板によって全体が補強されるので、構造を強固なものとすることができる。

【0028】さらに、詳しく吸音パネル100の実施例について説明する。この吸音パネル100は、表面と裏面を構成する吸音材101、103により角波形状のアルミニウム板102が挟まれ、このアルミニウム板102によって交互に位置する背後空気層104、105が構成されている。吸音材101と103は、直径が100μmのアルミニウム繊維を圧縮し、有機バインダーでバインドした板状を有する。この吸音材101と103

は、密度が 1.3 g/cm^3 、厚さが 2 mm 、面密度が 2000 g/m^2 である。

【0029】また、このアルミニウム繊維は、溶融アルミニウムを加圧して小径のノズルから吹き出させ、それを冷却することで得る。そして、このアルミニウム繊維に有機バインダーを加えて圧縮成形することで板状の吸音材料を得る。

【0030】一方、アルミニウム板102は、 2 mm 厚のアルミニウム板をプレス加工することで得る。そして、吸音材101と103は、このアルミニウム板102に接着剤でもって固定される。固定の方法は、接着剤によるものに限定されず、ビスやリベットによるもの、溶接やろう付けによるもの、それらを組み合わせた方法によるものなどを採用できる。

【0031】図4に示すグラフは、背後空気層の背後厚さを 300 mm とし、ピッチ幅dの寸法を $100\sim800\text{ mm}$ まで変化させた場合の吸音性能を表す統計入射吸音率である。

【0032】この場合、ピッチ幅dを 500 mm 以下、さらには 300 mm 以下とすることで、より高音域側での吸音性能が高められ、また全体としても吸音性能が高くなることが分かる。また、ピッチ幅dを 300 mm 以下としてもさほど吸音性能に変化がないことも分かる。なお、×印で示すのは、厚さ 50 mm のガラスウールの背後に 50 mm 厚の背後空気層を設けた場合の比較データである。

【0033】図5に示すグラフは、背後空気層の背後厚さを 200 mm とし、ピッチ幅dの寸法を $100\sim800\text{ mm}$ まで変化させた場合の吸音性能を表す統計入射吸音率である。

【0034】図4と図5のグラフにより、ピッチ幅dを 500 mm 以下、より好ましくは 300 mm 以下とすることで、より高音域側での吸音性能が高められ、さらに全体としても吸音性能を高くできることが分かる。なお、図5の×印で示すのは、厚さ 50 mm のガラスウー

ルの背後に 50 mm 厚の背後空気層を設けた場合の比較データである。

【0035】図2と図3に示す吸音パネル100は、106側と107側から入射する音波の吸音については両面方向とも吸音性能が同じものとなるが、表面と裏面において、ピッチ幅dの寸法を違うものとすれば、両面方向で異なる吸音性能を得ることができる。本発明に利用される波型形状板としては、角波形状以外に図6(A)～(D)に示すようなバリエーションを挙げができる。

【0036】

【発明の効果】本発明を採用することで、金属繊維を用いた吸音装置において、より吸音周波数帯域が広いものを得ることができる。また、簡単な構造でありながら、軽量で強固であり、リサイクル性にも優れる。さらに、限られた厚さでありながら両面における吸音性能を有する吸音装置を得ることができる。

【図面の簡単な説明】

【図1】発明に係る吸音装置の基本的な実施形態を示す説明用断面図。

【図2】本発明に係る吸音パネルの例を示す分解図。

【図3】同説明用断面図。

【図4】背後空気層の背後厚さを 300 mm とし、角波形状板のピッチ幅を変化させた吸音パネルの統計入射吸音率を示すグラフ。

【図5】背後空気層の背後厚さを 200 mm とした同様な吸音パネルの統計入射吸音率を示すグラフ。

【図6】本発明の実施形態におけるその他の波型形状板の断面構造を示す図。

【図7】従来例を示す吸音装置。

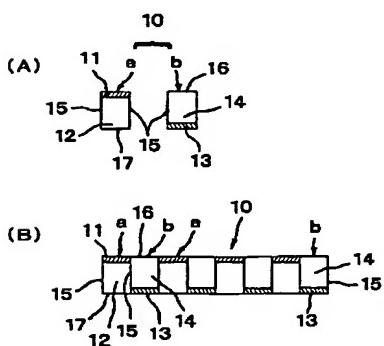
【符号の説明】

101 吸音材

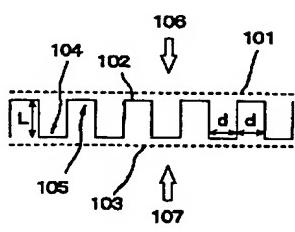
102 アルミニウム板

103 吸音材

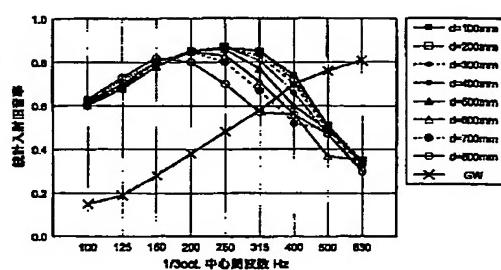
【図1】



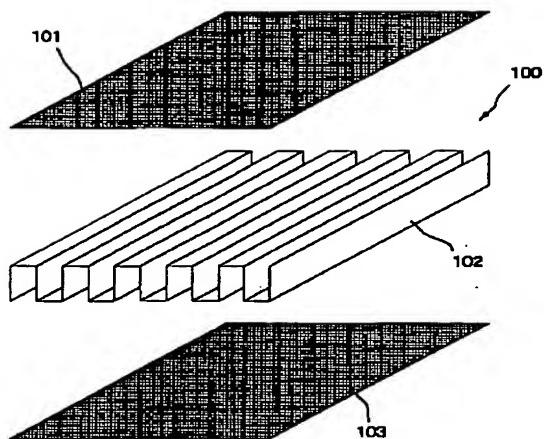
【図3】



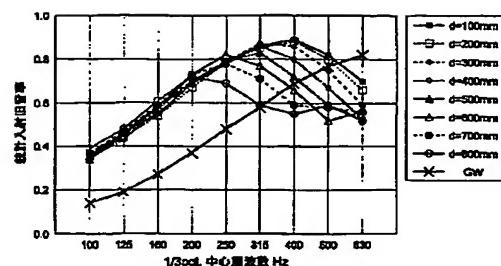
【図4】



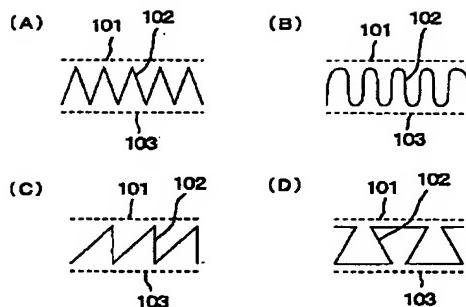
【図2】



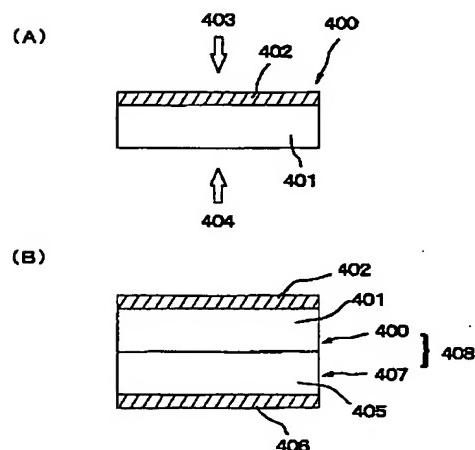
【図5】



【図6】



【図7】



フロントページの続き

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CLAIMS

[Claim(s)]

[Claim 1] Noise absorption equipment characterized by inserting the wave type configuration plate as the tabular acoustic material of the pair obtained by pressing a metal fiber ingredient is also.

[Claim 2] Noise absorption equipment according to claim 1 characterized by the pitch of a wave type configuration plate or its average being 500mm or less.

[Claim 3] Noise absorption equipment according to claim 1 characterized by the pitch of a wave type configuration plate or its average being 300mm or less.

[Claim 4] Noise absorption equipment according to claim 1 to 3 characterized by the metal fiber ingredient and the wave type configuration plate consisting of metal fibers, such as aluminum fiber and stainless steel fiber.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to noise absorption equipment, and in detail, by using the wave-motion-property of an acoustic wave in the noise absorption equipment which performs absorption of sound by operation of a back air space, though it is the limited thickness, it relates to the noise absorption equipment which can perform absorption of sound from both sides to a bass region.

[0002]

[Description of the Prior Art] As noise absorption equipment, what prepared the back air space behind inorganic fibers, such as glass wool and rock wool, is known widely.

[0003] The absorption-of-sound engine performance in a bass region, such as 500Hz or less, poses a problem as noise absorption equipment. What is necessary is to thicken the thickness and just to thicken a back air space further, using what has a consistency high as inorganic fibers, such as glass wool and rock wool, in order to raise the absorption-of-sound engine performance in a bass region. However, there are the following technical problems in this structure.

[0004] ** Weight to occupy, such as glass wool, is large and weight becomes heavy as a whole.

** It is not desirable to use so much the glass wool by which we are anxious about the bad influence to health.

** In long-term use, the absorption-of-sound performance degradation by moisture absorption and degradation of glass wool etc. serves as a technical problem.

** Glass wool etc. must be processed as industrial waste and a technical problem is in recycle nature.

[0005] The sound absorbing material using metal fibers, such as aluminum fiber, as a technique which solves such a technical problem is known (for example, refer to JP,5-2646,Y).

[0006] When aluminum fiber is used especially, even if it is lightweight and the thickness is thin, in a bass region, the high absorption-of-sound engine performance is obtained, and the technical problem mentioned above has an mostly cancelable advantage.

[0007]

[Problem(s) to be Solved by the Invention] As for such an acoustic material and noise absorption equipment equipped with the back air space prepared back [the], only the field which has arranged the sound absorbing material will have the absorption-of-sound engine performance, and the absorption-of-sound engine performance by the side of the field in which the back air space was prepared will be obtained.

[0008] By the way, the commercial scene is asked for that from which the absorption-of-sound engine performance is obtained to both sides in noise absorption equipment like an acoustical panel. For example, it may be used for the purpose of the acoustic tile of the noise which carries out incidence from an acoustical partition or both sides.

[0009] The noise absorption equipment 400 shown in drawing 7 (A) consists of a classic acoustic material 402 and a back air space 401, and although the acoustic wave which carries out incidence from 403 sides absorbs sound with this structure, the acoustic wave which carries out incidence from 404 sides does not absorb sound. That is, it is the structure where only the acoustic wave which carries out incidence from one side absorbs sound.

[0010] What is necessary is to prepare the noise absorption equipment 407 which further already consists of the acoustic material 406 and the back air space 405 of a lot, and just to let two noise absorption equipment 400 and 407 be noise absorption equipment 408 of the structure where it was made to rival back to back in this structure, so that you may make it drawing 7 (B) in order to enable absorption of sound from both sides.

[0011] However, as a whole, the thickness of noise absorption equipment 408 becomes thick, and, now, is not desirable as noise absorption equipment with many limits to an installation etc. Moreover, although the back air spaces 401 and 405 must be thickened when it is going to make high the absorption-of-sound engine performance in a bass region, the thickness of the noise-absorption-equipment 408 whole will become thick further in that case.

[0012] On the contrary, in the noise absorption equipment 408 of structure as shown in drawing 7 (B), if it is going to make thickness of the whole noise absorption equipment thin, the thickness of the back air spaces 401 and 405 will become small, and the predetermined absorption-of-sound effectiveness in a bass region will no longer be acquired.

[0013] This invention can solve the above-mentioned technical problem, can absorb sound from both sides especially, and is to offer the noise absorption equipment which sets it as the main purpose that the absorption-of-sound engine performance in a bass region is high.

[0014]

[Means for Solving the Problem] Invention of the 1st of the noise absorption equipment concerning this invention is characterized by inserting the wave type configuration plate as the tabular acoustic material of a pair which pressed the metal fiber ingredient is also.

[0015] Invention of the 2nd of this invention is characterized by the pitch of a wave type configuration plate or its average value being 500mm or less, 3rd invention is characterized by the pitch of a wave type configuration plate or its average value being 300mm or less, and 4th invention is characterized by the metal fiber ingredient and the wave type configuration plate consisting of metal fibers, such as aluminum fiber and stainless steel fiber.

[0016] As a wave type configuration plate, a cross section can mention roundish [wore the angle], the thing of a saw configuration, and the other things of the cross-section structure where a predetermined configuration is repeated periodically, in an angle wave-like thing and angle wave-like cross-section structure.

[0017]

[Function] By adopting the 1st invention, though it is easy and lightweight structure, double-sided noise absorption equipment excellent in the absorption-of-sound engine performance in a bass region is obtained.

[0018] By adopting the 2nd invention, the double-sided noise absorption equipment whose absorption of sound in a loud-sound region is attained more is obtained, absorption of sound to a loud-sound region is attained further more by adopting the 3rd invention, and the noise absorption equipment which was lightweight and was excellent in adopting the 4th invention at recycle nature is obtained.

[0019]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. The sectional view for explanation and drawing 1 (B) which show the fundamental operation gestalt of the noise absorption equipment concerning this invention drawing 1 (A) The sectional view for explanation and drawing 2 which show this combination ***** gestalt The exploded view and drawing 3 which show the example of the acoustical panel concerning this invention The graph and drawing 5 which show the statistical incidence sound absorption coefficient of the acoustical panel to which the sectional view for the said explanation and drawing 4 set back thickness of a back air space to 300mm, and the pitch of an angle wave-like plate was changed The graph which shows the statistical incidence sound absorption coefficient of the same acoustical panel which set back thickness of a back air space to 200mm, and drawing 6 are drawings showing the cross-section structure of the wave type configuration plate of others in the operation gestalt of this invention.

[0020] The fundamental operation gestalt of the noise absorption equipment 10 concerning introduction and this invention is explained based on drawing 1. The hollow cube type object a with

which this noise absorption equipment 10 consists of a surface acoustic material 11 and the surface back air space 12. The description is in the structure which the hollow cube type object b which consists of the acoustic material 13 and the back air space 14 of the rear face which made this and the sense reverse combined mutually so that acoustic material 11 and 13 might be located in a front face or a rear face by turns. The side-face plates 15 and 15 on either side, the faceplate 16 of acoustic material 11 and 13, or the flesh-side face-plate 17 consists of metallic materials which are ingredients of non-permeability.

[0021] According to this configuration, since thickness of the back air spaces 12 and 14 can be made into sufficient thickness, the absorption-of-sound engine performance to a bass region is securable. However, like drawing 1 (B), although the area of the acoustic material 11 and 13 contributed to absorption of sound serves as half on one side, if fully small, an acoustic wave will turn to the field of the acoustic material 11 and 13 which has the back air spaces 12 and 14, and it will absorb sound to some extent by the wave nature of an acoustic wave to the wavelength of the hollow cube type objects a, b, a, and b and the acoustic wave of -- in which the period of a repeat carries out incidence. Therefore, absorption of sound to a loud-sound region is attained more by the thing of the hollow cube type objects a, b, a, and b in drawing 1 (B), and -- for which the period of a repeat is finely made small. This inventions are the easier structure based on the fundamental operation gestalt mentioned above, and a thing obtained more as lightweight and a low cost thing.

[0022] Next, the acoustical panel 100 which shows an example which carried out this invention to drawing 2 and drawing 3 is explained. This acoustical panel 100 has the structure where the aluminum plate 102 into which aluminum fiber was processed in the shape of an angle wave as the acoustic material 101 and 103 compressed into tabular is also was inserted and fixed.

[0023] What carried out pressurization compression of the aluminum fiber whose diameter is 50-200 micrometers as aluminum fiber so that surface density might serve as 500 - 4000 g/m² and thickness might serve as the degree of 1-5mm is used. Moreover, it is good to use what carried out press working of sheet metal of the thing with a thickness of about 0.5-3mm to the shape of an angle wave as an angle wave-like aluminum plate 102. In addition, as sound absorbing materials 101 and 103, textile materials, stainless steel fiber, etc. which consist of metals other than aluminum can also be used.

[0024] The dimension of pitch d in an aluminum plate 102 has 300 preferably goodmm or less 500mm or less. It is arbitrary matters to also make the periodicity into a pitch which is different, without being limited to what made pitch d fixed, and to differ in the value of pitch d by the front-face and rear-face side etc. In addition, when the value of pitch d is not uniform, it is desirable to set the average to 300mm or less preferably 500mm or less. It becomes [the absorption-of-sound engine performance by the side of a loud-sound region falls that the value of pitch d is 500mm or more, and / the absorption-of-sound band as an acoustical panel] narrow and is not desirable.

[0025] The quality of the materials of an aluminum plate 102 may be inorganic fibers, such as metallic materials, such as metals other than aluminum, for example, stainless steel etc., and ingredients other than a metal, for example, glass wool, and rock wool. However, it is desirable to constitute all of acoustic material and an angle wave-like plate from aluminum especially in respect of recycle nature, endurance, and lightweight nature. Moreover, an angle wave-like plate serves as reinforcing materials, and can consider as a also structurally strong lightweight thing.

[0026] A certain thing of at least five or more (five or more periods) repeats of angle wave-like irregularity is preferably desirable ten or more (ten or more periods) pieces. This is because the predetermined absorption-of-sound effectiveness is not acquired unless it makes it that in which the aluminum plate 102 had a certain amount of area so that it may mention above.

[0027] The operation article of this invention can be used for the acoustical panel of the noise which carries out incidence from an acoustical partition or both sides besides usual noise absorption equipment etc. When this invention is adopted, the acoustical panel which can absorb sound from both sides excellent in the absorption-of-sound engine performance in a bass region can be obtained. Although this acoustical panel has the function which absorbs sound the acoustic wave from a 2-way, it has a predominance that the thickness conventionally needed for absorption of sound of the acoustic wave from the one direction of elegance is sufficient. Moreover, since the whole is reinforced with a wave type configuration plate, structure can be made firm.

[0028] Furthermore, the example of an acoustical panel 100 is explained in detail. The angle wave-like aluminum plate 102 is inserted with the acoustic material 101 and 103 with which this acoustical panel 100 constitutes a front face and a rear face, and the back air spaces 104 and 105 located by turns with this aluminum plate 102 are constituted. Acoustic material 101 and 103 compresses the aluminum fiber whose diameter is 100 micrometers, and has tabular [which was bound with the organic binder]. For a consistency, 1.3 g/cm³ and thickness are [2mm and the surface density of these acoustic material 101 and 103] 2000 g/m².

[0029] Moreover, this aluminum fiber pressurizes melting aluminum, is made to blow off from the nozzle of a minor diameter, and is obtained by cooling it. And a sound absorbing material tabular by adding and pressing an organic binder into this aluminum fiber is obtained.

[0030] On the other hand, an aluminum plate 102 is obtained by carrying out press working of sheet metal of the aluminum plate of 2mm thickness. And acoustic material 101 and 103 is fixed as it is also with adhesives to this aluminum plate 102. The approach of immobilization is not limited to what is depended on adhesives, but what is depended on a screw or a rivet, the thing to depend on welding or soldering, the thing to depend on the approach which combined them can be used for it.

[0031] The graph shown in drawing 4 is a statistical incidence sound absorption coefficient expressed with the absorption-of-sound engine performance at the time of setting back thickness L of a back air space to 300mm, and changing the dimension of pitch d to 100-800mm.

[0032] In this case, it turns out that the absorption-of-sound engine performance by the side of a loud-sound region is raised more, and the absorption-of-sound engine performance becomes high also as the whole by setting pitch d to 500mm or less and 300 moremm or less. Moreover, pitch d is also understood that there is no change in the absorption-of-sound engine performance so much also as 300mm or less. In addition, it is comparison data at the time of preparing the back air space of 50mm thickness behind glass wool with a thickness of 50mm which x mark shows.

[0033] The graph shown in drawing 5 is a statistical incidence sound absorption coefficient showing the absorption-of-sound engine performance at the time of setting back thickness L of a back air space to 200mm, and changing the dimension of pitch d to 100-800mm.

[0034] It turns out that it is setting pitch d to 300mm or less more preferably 500mm or less, the absorption-of-sound engine performance by the side of a loud-sound region is raised more, and the absorption-of-sound engine performance can be further made high also as the whole with the graph of drawing 4 and drawing 5. In addition, it is comparison data at the time of preparing the back air space of 50mm thickness behind glass wool with a thickness of 50mm which x mark of drawing 5 shows.

[0035] The acoustical panel 100 shown in drawing 2 and drawing 3 can obtain the thing which is different in the dimension of pitch d, then absorption-of-sound engine performance which is different in the direction of both sides in a front face and a rear face, although the direction of both sides becomes what has the same absorption-of-sound engine performance about the absorption of sound of an acoustic wave which carries out incidence from 106 and 107 side. As a wave type configuration plate used for this invention, a variation as shown in drawing 6 (A) - (D) in addition to the shape of an angle wave can be mentioned.

[0036]

[Effect of the Invention] By adopting this invention, what has a more large absorption-of-sound frequency band can be obtained in the noise absorption equipment using a metal fiber. Moreover, though it is easy structure, it is lightweight, is firm and excels also in recycle nature. Furthermore, though it is the limited thickness, the noise absorption equipment which has the absorption-of-sound engine performance in both sides can be obtained.

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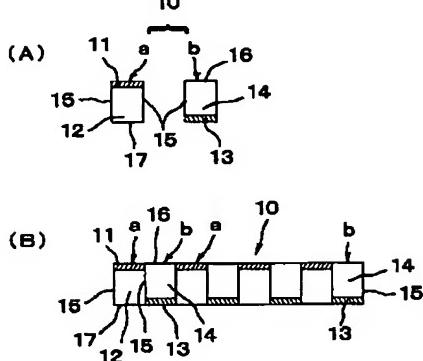
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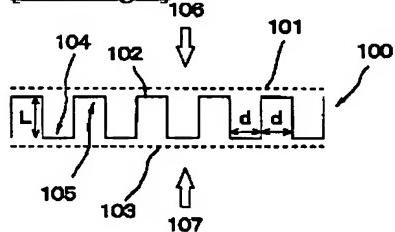
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DRAWINGS

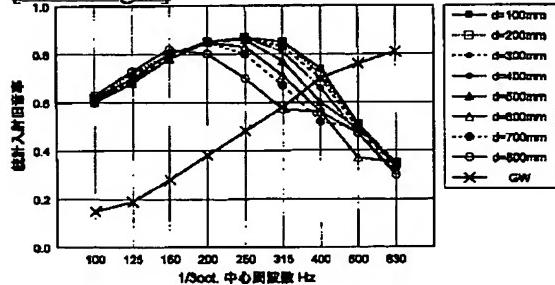
[Drawing 1]



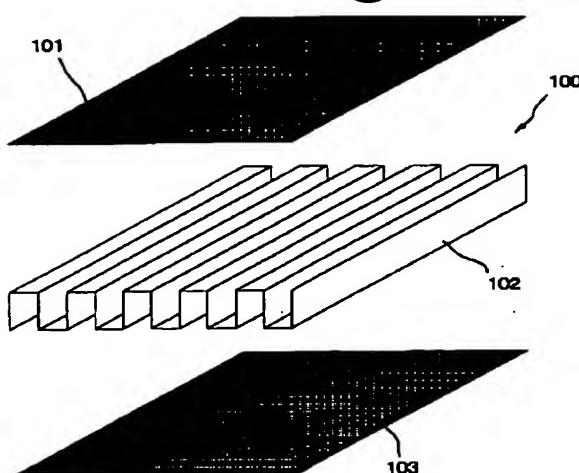
[Drawing 3]



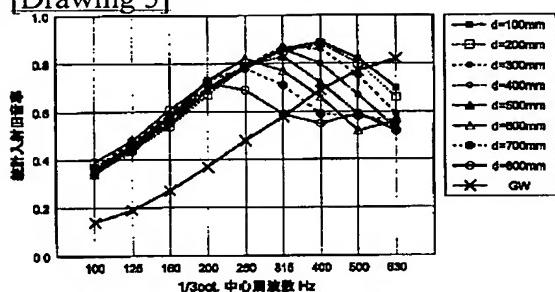
[Drawing 4]



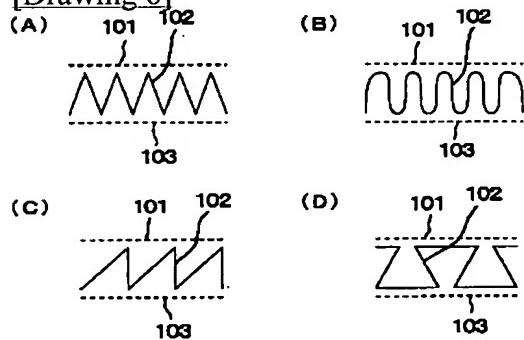
[Drawing 2]



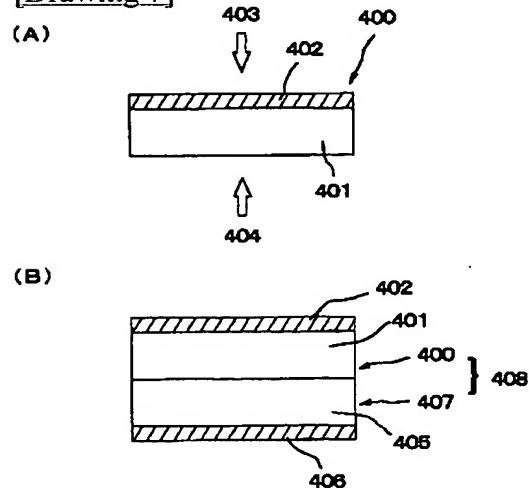
[Drawing 5]



[Drawing 6]



[Drawing 7]



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